said engine output shaft to the output speed of said transmission output shaft; and

an engine control to control a parameter of said engine, said engine control including an operator input to allow an operator to signal a desire to eliminate torque between said engine output shaft and said transmission output shaft, said operator signal requesting said engine control to determine a zero torque parameter value for said engine output shaft that approximates a zero torque load on the connection between said engine and said transmission, and said engine control being operable to control said engine to achieve said zero torque parameter value.

36. A vehicle drive as recited in claim 35, wherein said engine parameter is the amount of fuel delivered to said engine.

37. A vehicle drive as recited in claim 35, wherein said zero torque parameter value is a predicted value based at least in part on a sensed engine speed.

38. A vehicle drive as recited in claim 37, wherein said control is operable to vary said engine parameter above and below said predicted zero torque value as a function of time.

39. A vehicle drive as recited in claim 38, wherein said engine parameter is controlled to move above and below said predicted value with a saw tooth profile.

40. A vehicle drive as recited in claim 35, wherein said engine control also controls the speed of said engine after said transmission has been moved to a neutral position by predicting a synchronizing speed for said engine output shaft at the next speed ratio for said transmission, and said engine control being operable

to change said engine speed to achieve said synchronizing speed.

41. A vehicle drive as recited in claim 35, wherein a manual stick shift allows an operator to manually shift said transmission speed ratios.

42. A vehicle drive as recited in claim 41, wherein a selectively actuated clutch is disposed between said transmission and said engine output shaft.

43. A method of operating a vehicle drive comprising the steps of:

a. providing an engine, an engine fuel control, a transmission driven by an output shaft of said engine, said transmission being provided with several selectively actuated speed ratios, and an operator input switch to indicate a desire to eliminate torque on said transmission and allow the operator to move said transmission to begin a speed ratio shift;

b. indicating a desire to eliminate torque by actuating said input switch;

c. determining a zero torque fuel to reduce the torque load between said engine and said transmission;

d. modifying said engine fueling by said controller to achieve said zero torque fuel value; and

e. manually moving said transmission out of engagement to a neutral position.

44. A method as recited in claim 43, including the further steps of predicting the next selected gear ratio after said transmission has been moved to neutral, predicting a synchronizing speed for said engine output shaft at said next selected gear ratio, and using said engine control to begin moving said engine speed towards said synchronizing speed.

45. A method as recited in claim 43, wherein said zero torque fuel value is predicted based upon certain system conditions.

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46. A method as recited in claim 45, wherein said engine fueling is adjusted above and below said predicted value as a function of time.

47. A method as recited in claim 45, wherein said zero torque value is predicted based upon engine speed.

48. A method of operating a vehicle drive comprising the steps of:

a. providing an engine, an engine parameter control, a multi-speed transmission driven by an output shaft of said engine, said transmission being provided with several selectively actuated speed ratios, a manual stick shift for changing speed ratios in said transmission;

b. predicting a zero torque parameter value for said engine based on system variables;

c. modifying said engine parameter by said engine control to achieve said zero torque value; and

d. manually moving said transmission out of engagement to a neutral position.

49. A method as recited in claim 48, wherein said predicted value is based at least in part on engine speed.

50. A method as recited in claim 48, wherein said engine parameter is adjusted above and below said zero torque value as a function of time.

51. A vehicle drive as recited in claim 37, wherein said predicted value includes a component calculated based upon an acceleration value for the transmission output shaft.

52. A vehicle drive as recited in claim 51, wherein the predicted zero torque parameter includes a component based upon oil temperature of the engine.

53. A method as recited in claim 48, wherein said zero torque parameter is predicted based upon the acceleration of the transmission output speed.

54. A vehicular semi-automated shift implementation system comprising:

a manually shifted transmission having an input shaft driven by a fuel-controlled engine, an output shaft and a plurality of selectably engageable and disengageable jaw clutches allowing selection of a plurality of drive ratios and neutral, said jaw clutches selectively positioned by a manually operated shift lever having a plurality of selectable shift lever positions defining a

shift pattern;

means to sense conditions indicative of an operator intention to shift said transmission into neutral and effective, upon sensing conditions indicative to an operator intention to shift into neutral, to automatically cause said engine to be fueled to minimize torque transfer between said input shaft and said output shaft.

55. The system of claim 54 wherein said jaw clutches are non-synchronized jaw clutches.

56. The system of claim 54 wherein said conditions comprise operator manipulation of the shift lever.

57. The system of claim 54 further comprising means for sensing transmission neutral and upon sensing transmission neutral, terminating fueling of the engine to minimize torque transfer between said input shaft and said output shaft.

58. A vehicular semi-automated shift implementation system comprising:

a manually shifted transmission having an input shaft driven by a fuel-controlled engine, an output shaft and a plurality of selectably engageable and disengageable jaw clutches allowing selection of a plurality of drive ratios and neutral, said jaw clutches selectively positioned by a manually operated shift lever having a plurality of selectable shift lever positions defining a shift pattern;

an engine controller effective to fuel said engine in accordance with command output signals;

an operator-actuated intent-to-shift switch for providing an intent-to-shift signal indicative of operator intent to shift into neutral; and

a controller for receiving input signals including said intent-to-shift signals and for processing same according to predetermined logic rules to issue command output signals to system actuators including said engine controller.

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59. The system of claim 58 wherein said logic rules include rules for causing said engine to be fueled to minimize torque transfer between said input and output shafts upon sensing operator actuation of said intent-to-shift switch.

60. The system of claim 58 wherein said jaw clutches are non-synchronized jaw clutches.

61. The system of claim 59 wherein said jaw clutches are non-synchronized jaw clutches.

62. The system of claim 59 further comprising sensors for providing input signals indicative of the engaged and neutral condition of said transmission, said logic rules including rules for determining if the transmission is in neutral and for causing engine fueling to minimize torque transfer between said input and output shafts only if said transmission is not in neutral.

63. The system of claim 61 further comprising sensors for

providing input signals indicative of the engaged and neutral condition of said transmission, said logic rules including rules for determining if the transmission is in neutral and for causing engine fueling to minimize torque transfer between said input and output shafts only if said transmission is not in neutral.

64. The system of claim 58 wherein said switch is a button resiliently biased to a non-activated position and located on said shift lever.

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65. The system of claim 59 wherein said switch is a button resiliently biased to a non-activated position and located on said shift lever.

66. The system of claim 61 wherein said switch is a button resiliently biased to a non-activated position and located on said shift lever.

67. The system of claim 62 wherein said switch is a button resiliently biased to a non-activated position and located on said shift lever.

68. The system of claim 58 wherein said engine is drivingly connected to said input shaft by a manually controlled friction clutch, further comprising sensors providing input signals indicative of the engaged and disengaged conditions of said friction clutch, and said logic rules include rules for determining the engaged and disengaged conditions of said friction clutch and causing said engine to be fueled in accordance with operator demand

upon sensing disengagement of said friction clutch.

69. The system of claim 59 wherein said engine is drivingly connected to said input shaft by a manually controlled friction clutch, further comprising sensors providing input signals indicative of the engaged and disengaged conditions of said friction clutch, and said logic rules include rules for determining the engaged and disengaged conditions of said friction clutch and causing said engine to be fueled in accordance with operator demand upon sensing disengagement of said friction clutch.

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70. The system of claim 61 wherein said engine is drivingly connected to said input shaft by a manually controlled friction clutch, further comprising sensors providing input signals indicative of the engaged and disengaged conditions of said friction clutch, and said logic rules include rules for determining the engaged and disengaged conditions of said friction clutch and causing said engine to be fueled in accordance with operator demand upon sensing disengagement of said friction clutch.

71. The system of claim 62 wherein said engine is drivingly connected to said input shaft by a manually controlled friction clutch, further comprising sensors providing input signals indicative of the engaged and disengaged conditions of said friction clutch, and said logic rules include rules for determining the engaged and disengaged conditions of said friction clutch and causing said engine to be fueled in accordance with operator demand

upon sensing disengagement of said friction clutch.

72. The system of claim 64 wherein said engine is drivingly connected to said input shaft by a manually controlled friction clutch, further comprising sensors providing input signals indicative of the engaged and disengaged conditions of said friction clutch, and said logic rules include rules for determining the engaged and disengaged conditions of said friction clutch and causing said engine to be fueled in accordance with operator demand upon sensing disengagement of said friction clutch.

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73. The control system of claim 58 further comprising a microprocessor-based computer mounted to said engine and having a memory, said logic rules stored in said memory.

74. The control system of claim 59 further comprising a microprocessor-based computer mounted to said engine and having a memory, said logic rules stored in said memory.

75. A vehicular semi-automated shift implementation system comprising:

a manually shifted transmission having an input shaft driven by a fuel-controlled engine, an output shaft and a plurality of selectably engageable and disengageable jaw clutches allowing selection of a plurality of drive ratios and neutral, said jaw clutches selectively positioned by a manually operated shift lever having a plurality of selectable shift lever positions defining a shift pattern;

a manually operated intent-to-shift switch by which an operator can signal an intention to manually shift the transmission;

means to sense operation of said intent-to-shift switch and effective, upon sensing operation of said intent-to-shift switch, to automatically cause said engine to be fueled to minimize torque transfer between said input shaft and said output shaft.

76. The system of claim 75 wherein said switch comprises a manually operated button located on said shift lever.

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77. The system of claim 75 further comprising means for sensing transmission neutral and upon sensing transmission neutral, terminating fueling of the engine to minimize torque transfer between said input shaft and said output shaft.

78. The system of claim 76 further comprising means for sensing transmission neutral and upon sensing transmission neutral, terminating fueling of the engine to minimize torque transfer between said input shaft and said output shaft.

79. A vehicle drive comprising:

an engine having an output shaft and an electronic control unit for controlling the output speed of said engine output shaft;

a multi-speed transmission, said multi-speed transmission being selectively connected to said engine output shaft and operable to convert drive from said engine output shaft through

several speed ratios to an output speed on a transmission output shaft;

a clutch that may be selectively actuated by an operator, said clutch positioned between said engine and said transmission; and

an input control for an operator, said input control allowing an operator to provide an indication to said electronic control unit of whether an upshift or a downshift is to be initiated, and further providing the operator the ability to request torque elimination during this shift, said electronic control unit being operable to receive signals from said input control, and determine a desired engine speed at the next gear ratio based upon said operator indication, and to control said engine to achieve said desired engine speed, and said electronic control unit further being operable to modify an engine parameter to achieve reduced torque transmission to said transmission to allow an operator to move said transmission to a neutral position when a signal requesting torque elimination is received from said input control.

80. A vehicle drive as recited in claim 79, wherein an operator is able to indicate upshift or downshift without requesting torque elimination.

81. A vehicle drive as recited in claim 79, wherein said electronic control unit achieves torque elimination by predicting

an engine parameter that results in a zero torque load from the engine through the transmission, and beginning to move the engine parameter to that predicted value when a request for torque elimination is received.

82. A vehicle drive as recited in claim 79, wherein a single switch having three positions is utilized to provide both the shift intent and the torque elimination request.

83. A method of operating a vehicle comprising the steps of:

a. providing a vehicle drive including an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, a multi-speed transmission selectably driven by said engine output shaft, said multi-speed transmission being operable to be moved between several speed ratios to control the ratio between an output speed on an output shaft of said transmission and the speed of said engine output shaft, a clutch disposed between said engine output shaft and said transmission to allow a elimination of drive from said engine to said transmission, and an operator input switch system allowing an operator to provide an indication to said electronic control unit of when an upshift or a downshift is to be expected as the next shift, and further providing the operator the ability to request torque elimination from said electronic control unit such that the

transmission may be moved to neutral without actuating said clutch;

b. providing an indication to said electronic control unit of whether an upshift or a downshift is expected as the next gear shift;

c. identifying a desired engine speed at the next expected gear ratio based upon said driver input of whether an upshift or a downshift is next expected;

d. providing a torque elimination request from said operator switch;

e. controlling an engine parameter to reduce the torque load from said engine on said transmission;

f. manually moving said transmission to neutral;

g. using said electronic control unit to begin moving said engine output speed to said desired engine speed; and

h. engaging said transmission in said next selected gear.

84. A method as recited in claim 83, wherein a three position switch is utilized with one position being no shift intent, a second position being an upshift indicated and torque elimination, and a third position being a downshift indicated and torque elimination.

85. A method as recited in claim 83, wherein said electronic control unit controls said engine even when no shift is occurring.

86. A method of controlling the operation of a vehicle drive comprising the steps of:

a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine, a multi-speed transmission to be driven by said engine output shaft, a manual stick shift for allowing an operator to manually shift said multi-speed transmission between several speed ratios, and a driver intent switch allowing a driver to provide an indication to said electronic control unit of whether an upshift or a downshift is to be next expected, said electronic control unit using said driver intent signal to determine what the next speed ratio to be engaged by a manual shift by the operator will be, said electronic control unit then determining what engine synchronized speed would be necessary to achieve a synchronized shift to said next speed ratio at the present transmission output speed, and said electronic control unit being operable to change the output speed of said engine output shaft to achieve said synchronized speed;

b) operating a vehicle using the system provided in step a);

c) determining a currently engaged gear;

d) utilizing said driver intent switch to provide a signal of whether an upshift or a downshift will be the next expected shift;

e) determining a desired engine synchronization speed at

a next expected gear by determining said next expected gear based upon said currently engaged gear and said shift intent signal of step d), identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed; and

f) beginning to control said output speed of said engine output shaft to approach said synchronization speed, and

g) manually shifting said multi-speed transmission to said next expected gear.

87. A method as recited in claim 86, wherein a signal is provided to said electronic control unit of when said multi-speed transmission has moved to neutral, and said electronic control unit beginning to change said engine speed once it receives said signal.

88. A method as recited in claim 87, wherein said electronic control unit determines said currently engaged gear by monitoring the output speed of said engine output shaft and said transmission output shaft, calculating a ratio, comparing said calculated ratio to expected ratios in a look-up table, and identifying said currently engaged gear by matching said calculated ratio to the look-up table ratios.

89. A method as recited in claim 88, where said

identified currently engaged gear is stored, and is periodically identified during operation of the vehicle, and the stored currently engaged gear is updated when necessary.

90. A method as recited in claim 86, wherein a clutch is disposed between said engine output shaft and said transmission.

91. A method of controlling the operation of a vehicle, comprising the steps of:

a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission, and said electronic control unit being operable to calculate the ratio of the transmission and engine output shaft speeds, and determine which gear is currently engaged;

b) operating a vehicle using the system provided in step a);

c) determining a currently engaged gear by calculating the ratio of the engine and transmission output shaft speeds, and comparing said calculated ratio to expected ratios;

d) determining whether an upshift or a downshift is to be expected as the next shift;

e) determining a desired engine synchronization speed at a next expected gear by determining said next expected gear based

upon said currently engaged gear and said expected shift of step d), and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed; and

f) beginning to control said output speed of said engine output shaft to approach said synchronization speed; and

g) shifting said multi-speed transmission toward said next expected gear.

92. A method as recited in claim 91, wherein the determination of step d), includes providing an operator shift intention switch, and moving said switch between position indicating an upshift or a downshift as appropriate.

93. A method as recited in claim 92, wherein step f) does not occur until a signal is received that said transmission has moved into neutral.

94. A method as recited in claim 91, wherein said determination of step d) is made by said electronic control unit based upon vehicle operating parameters.

95. A method as recited in claim 94, wherein step f) does not occur until a signal is received that said transmission

has moved into neutral.

96. A method as recited in claim 91, wherein step f) does not occur until a signal is received that said transmission has moved into neutral.

97. A method as recited in claim 91, where said identified currently engaged gear is stored, and is periodically identified during operation of the vehicle and the stored currently engaged gear is updated when necessary.

98. A method as recited in claim 91, wherein a clutch is disposed between said engine output shaft and said transmission.

99. A method as recited in claim 91, wherein step e) is repeated periodically to consider changes in said transmission output speed.

100. A vehicle drive system comprising:

a) an engine having an output shaft;

b) an electronic control unit for controlling an output speed of said engine;

c) a multi-speed transmission operably connected to be driven by said engine output shaft;

d) a manual stick shift to allow an operator to change the speed ratios of said transmission; and

e) a driver shift intent switch to allow a driver to send a signal to said electronic control unit of whether an upshift or a downshift is to be next expected, said electronic control unit being operable to determine a currently engaged gear, determine a next expected gear based upon said currently engaged gear and said driver shift intent signal, determine a synchronization speed for shifting to said next expected gear, and change said engine speed to move toward said synchronization speed when a shift is being made.

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101. A system as recited in claim 100, wherein said electronic control unit calculates and updates said currently engaged gear during operation of said system.

102. A system as recited in claim 100, wherein a clutch is disposed between said engine output shaft and said transmission.

103. A vehicle drive system as recited in claim 100, wherein said electronic control unit is provided with a look-table of the speed ratios at the several available gear in said multi-speed transmission.

104. A system as recited in claim 103, wherein said electronic control unit utilizes said look-up table to determine said currently engaged gear, and also to determine a speed ratio at said next expected gear.

105. A method of controlling the operation of a vehicle, comprising the steps of:

a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission through a clutch, and said electronic control unit being operable to determine a currently engaged gear in said transmission, and further to calculate the speed ratio at a next expected gear, and determine a synchronization speed for the engine based upon the speed ratio at said next expected gear, and the transmission output speed;

42 Cont b) operating a vehicle using the system provided in step a);

c) periodically determining the currently engaged gear by monitoring system variables;

d) determining whether an upshift or a downshift is to be expected as the next shift;

e) determining a desired engine synchronization speed at a next-expected gear by determining said next expected gear based upon said currently engaged gear and said expected shift of step d), and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed;

f) beginning to control said output speed of said engine

output shaft to approach said synchronization speed; and

g) manually shifting said multi-speed transmission towards the next expected gear.

106. A method of controlling the operation of a vehicle, comprising the steps of:

a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission through a clutch, and said electronic control unit being operable to determine a currently engaged gear in said transmission, and further to calculate the speed ratio at a next expected gear, and determine a synchronization speed for the engine based upon the speed ratio at said next expected gear, and the transmission output speed, and providing an operator with a shift intent switch to provide a signal to said electronic control unit of whether an upshift or a downshift is expected as said next expected shift, said electronic control unit being operable to calculate the ratio of the transmission and engine output speeds to determine a currently engaged gear, and determine a next-expected gear based upon said currently engaged gear and said driver shift intent signal;

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b) operating a vehicle using the system provided in step a);

c) determining a currently engaged gear;

d) determining whether an upshift or a downshift is to be expected as the next shift based upon a signal from said driver shift intent switch;

e) receiving a signal that said transmission has been moved to neutral;

f) determining a desired engine synchronization speed at a next-expected gear by determining said next expected gear based upon said currently engaged gear and said expected shift of step d), and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed;

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g) beginning to control said output speed of said engine output shaft to approach said synchronization speed; and

h) manually shifting said multi-speed transmission towards said next expected gear.

107. A method of controlling the operation of a vehicle, comprising the steps of:

a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission through a clutch, and said electronic control unit being operable to determine a currently engaged gear in said transmission, and further to calculate the speed ratio at a next expected gear, and determine a synchronization speed for the

engine based upon the speed ratio at said next expected gear, and the transmission output speed, and providing an operator with a shift intent switch to provide a signal to said electronic control unit of whether an upshift or a downshift is expected as said next expected shift, said electronic control unit being operable to calculate the ratio of the transmission and engine output speeds to determine a currently engaged gear, and determine a next-expected gear based upon said currently engaged gear and said driver shift intent signal;

b) operating a vehicle using the system provided in step a);

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c) determining a currently engaged gear;

d) determining whether an upshift or a downshift is to be expected as the next shift based upon a signal from said driver shift intent switch;

e) receiving a signal that said transmission has been moved to neutral;

f) determining a desired engine synchronization speed at a next-expected gear by determining said next expected gear based upon said currently engaged gear and said expected shift of step d), and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed;

g) beginning to control said output speed of said engine

output shaft to approach said synchronization speed, and repeating steps e) and f); and

h) manually shifting said multi-speed transmission towards said next expected gear.

108. A method as recited in claim 107, wherein a manual stick shift is used to change the transmission speed ratios.

109. A manually shifted vehicular transmission system comprising:

a transmission section having an input shaft driven by a fuel-controlled engine, an output shaft, a plurality of selectably engageable and disengageable drive ratios, and a selectable neutral, all of said drive ratios and neutral selected by means of selectively engaged and disengaged jaw clutches operatively positioned by a manually operated shift lever having a plurality of shift lever positions;

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means to sense a transmission section neutral condition;

means to determine a forward target gear ratio; and

means to automatically control fueling of the engine, said means effective, upon sensing transmission section neutral, to cause the engine to achieve a synchronous speed for engaging said target gear ratio.

110. The system of claim 109 wherein said transmission section comprises a main transmission section (12) of a compound transmission.

111. The system of claim 109 further comprising means to sense engagement of said target gear ratio, said means to automatically control fueling effective to cause engine fueling to be in accordance with operator demand upon sensed engagement of said target ratio.

112. The system of claim 109 wherein said jaw clutches are non-synchronized jaw clutches.

113. The system of claim 109 wherein said engine is drivingly connected to said input shaft by a manually controllable friction clutch and further comprising means for sensing a non-engaged condition of said friction clutch, said means to automatically control fueling effective to cause engine fueling to be in accordance with operator demand upon sensed non-engagement of said friction clutch.

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114. The system of claim 111 wherein said engine is drivingly connected to said input shaft by a manually controllable friction clutch and further comprising means for sensing a non-engaged condition of said friction clutch, said means to automatically control fueling effective to cause engine fueling to be in accordance with operator demand upon sensed non-engagement of said friction clutch.

115. The system of claim 112 wherein said engine is drivingly connected to said input shaft by a manually controllable friction clutch and further comprising means for sensing a non-

engaged condition of said friction clutch, said means to automatically control fueling effective to cause engine fueling to be in accordance with operator demand upon sensed non-engagement of said friction clutch.

116. The system of claim 109 further comprising means to sense conditions indicative of an operator intent to shift into transmission section neutral from a currently engaged ratio, said means to automatically control fueling effective to cause the engine to be fueled to minimize torque at currently engaged jaw clutches in response to sensing said conditions indicative of an operator intent to shift into transmission section neutral.

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117. The system of claim 111 further comprising means to sense conditions indicative of an operator intent to shift into transmission section neutral from a currently engaged ratio, said means to automatically control fueling effective to cause the engine to be fueled to minimize torque at currently engaged jaw clutches in response to sensing said conditions indicative of an operator intent to shift into transmission section neutral.

118. The system of claim 112 further comprising means to sense conditions indicative of an operator intent to shift into transmission section neutral from a currently engaged ratio, said means to automatically control fueling effective to cause the engine to be fueled to minimize torque at currently engaged jaw clutches in response to sensing said conditions indicative of an

operator intent to shift into transmission section neutral.

119. The system of claim 113 further comprising means to sense conditions indicative of an operator intent to shift into transmission section neutral from a currently engaged ratio, said means to automatically control fueling effective to cause the engine to be fueled to minimize torque at currently engaged jaw clutches in response to sensing said conditions indicative of an operator intent to shift into transmission section neutral.

120. The system of claim 111 further comprising sensors for providing input signals indicative of input shaft and output shaft speeds, said means to sense engagement of said target gear ratio making such determination as a function of said speed signals.

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121. The system of claim 109 further comprising sensors for providing input signals indicative of input shaft and output shaft speeds, and means for sensing engagement of said drive ratios as a function of said speed signals.

122. The control system of claim 109 wherein said engine includes a microprocessor-based engine controller mounted to said engine and having a memory, said means to sense transmission neutral, determine a target gear ratio and automatically control fueling comprising logic rules stored in said memory.

123. The control system of claim 109 wherein said engine includes a microprocessor-based engine controller having a memory, said means to determine a target gear ratio and to automatically

control fueling comprising logic rules stored in said memory.

124. The control system of claim 113 wherein said engine includes a microprocessor-based engine controller having a memory, said means to determine a target gear ratio and to automatically control fueling comprising logic rules stored in said memory.

125. The control system of claim 114 wherein said engine includes a microprocessor-based engine controller having a memory, said means to determine a target gear ratio and to automatically control fueling comprising logic rules stored in said memory.

126. The control system of claim 116 wherein said engine includes a microprocessor-based engine controller having a memory, said means to determine a target gear ratio and to automatically control fueling comprising logic rules stored in said memory.

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127. The control system of claim 117 wherein said engine includes a microprocessor-based engine controller having a memory, said means to determine a target gear ratio and to automatically control fueling comprising logic rules stored in said memory.

128. The control system of claim 119 wherein said engine includes a microprocessor-based engine controller having a memory, said means to determine a target gear ratio and to automatically control fueling comprising logic rules stored in said memory.

129. A microprocessor-based system controller for controlling a manually shifted vehicular transmission system comprising a transmission section having an input shaft driven by a fuel-

controlled engine, an output shaft, a plurality of selectably engageable and disengageable drive ratios, and a selectable neutral, all of said drive ratios and neutral selected by means of selectively engaged and disengaged jaw clutches operatively positioned by a manually operated shift lever having a plurality of shift lever positions, said system controller having a memory storing logic rules effective:

to sense a transmission section neutral condition;

to determine a forward target gear ratio;

to automatically control fueling of the engine, including, upon sensing transmission section neutral, causing the engine to achieve a synchronous speed for engaging said target gear ratio; and

to sense engagement of said target gear ratio and to automatically cause engine fueling to be in accordance with operator demand upon sensed engagement of said target gear ratio.

130. The system controller of claim 123 wherein said engine is drivingly connected to said input shaft by a manually controllable friction clutch, said logic rules further comprising logic rules for sensing a non-engaged condition of said friction clutch, and to automatically cause engine fueling to be in accordance with operator demand upon sensed non-engagement of said friction clutch.

131. A microprocessor-based system controller for controlling

a manually shifted vehicular transmission system comprising a transmission section having an input shaft driven through a manually controllable friction clutch by a fuel-controlled engine, an output shaft, a plurality of selectably engageable and disengageable drive ratios, and a selectable neutral, all of said drive ratios and neutral selected by means of selectively engaged and disengaged jaw clutches operatively positioned by a manually operated shift lever having a plurality of shift lever positions, said system controller having a memory storing logic rules effective:

to sense a transmission section neutral condition;

to determine a forward target gear ratio;

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to automatically control fueling of the engine, and effective, upon sensing transmission section neutral, to cause the engine to achieve a synchronous speed for engaging said target gear ratio; and

for sensing a non-engaged condition of said friction clutch and to automatically cause engine fueling to be in accordance with operator demand upon sensed non-engagement of said friction clutch.

132. A method of controlling the operation of a vehicle comprising the steps of:

(a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission through a clutch, and said electronic control unit being provided with information regarding a currently engaged gear in said transmission, and further to calculate the speed ratio at a next expected gear and determine a synchronization speed for the engine based upon the speed ratio at said next expected gear and

the transmission output speed;

(b) operating a vehicle using ~~the~~ system provided in step (a);

(c) determining the currently engaged gear and whether an upshift or a downshift is to be expected as the next shift based upon system operating conditions;

(d) determining a next expected gear based upon said currently engaged gear and said expected shift of step (c);

(e) receiving a signal that said transmission has been moved to neutral and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed and beginning to control said output speed of said engine output shaft to approach said

synchronization speed;

(f) varying said engine output speed above and below said synchronization speed such that said engine output speed periodically crosses an actual required synchronization speed for said transmission; and

(g) manually shifting said multi-speed transmission towards said next expected gear.

133. A method as recited in claim 132, further including the step of providing an offset to said desired engine synchronization speed of a set value such that said engine synchronization speed and said actual engine speed do not match identically for any lengthy period of time.

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134. A method as recited in claim 132, wherein said electronic control unit periodically determines said currently engaged gear by monitoring the actual output speed of said engine and the actual output speed of the transmission, determining an actual speed ratio, comparing said actual speed ratio to expected ratios in a reference table, and updating a memory for said currently engaged gear if said determined currently engaged gear differs from that in said memory.

135. A method as recited in claim 134, wherein the determination of said currently engaged gear is made prior to the

movement to neutral of step (c).

136. A method as recited in claim 132, wherein the determination of an upshift or downshift of step (c) is taken from an operator intent switch.

137. A method as recited in claim 136, wherein said operator intent switch is combined with an operator torque elimination request switch, and said electronic control unit reducing the torque load between said engine and said transmission upon receiving a torque elimination request signal.

138. A method as recited in claim 132, wherein said stick shift controls components within said transmission to manually move said components to change a speed ratio.

139. A method of controlling the operation of a vehicle comprising the steps of:

(a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission through a clutch, and said electronic control unit being provided with information regarding a currently engaged gear in said transmission, and further to calculate the speed ratio at a next expected gear and determine a synchronization speed for the engine based upon the speed ratio at said next

expected gear and

the transmission output speed;

(b) operating a vehicle using the system provided in step (a);

(c) determining the currently engaged gear and whether an upshift or a downshift is to be expected as the next shift based upon system operating conditions;

(d) determining a next expected gear based upon said currently engaged gear and said expected shift of step (c);

(e) receiving a signal that said transmission has been moved to neutral and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed and beginning to control said output speed of said engine output shaft to approach said synchronization speed;

(f) adding an offset to said synchronization speed, and begin varying said engine output speed to approach said synchronization speed, with said offset; and

(g) manually shifting said multi-speed transmission towards said next expected gear.

140. A method of controlling the operation of a vehicle comprising the steps of:

(a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission through a clutch, and said electronic control unit being provided with information regarding a currently engaged gear in said transmission, and further to calculate the speed ratio at a next expected gear and determine a synchronization speed for the engine based upon the speed ratio at said next expected gear and the transmission output speed, and a driver shift intent signal to allow a driver to provide an indication of the next expected shift direction;

(b) operating a vehicle using the system provided in step (a);

(c) determining the currently engaged gear, and the predicted shift direction based upon said driver shift intent switch;

(d) determining a next expected gear based upon said currently engaged gear and said expected shift of step (c);

(e) receiving a signal that said transmission has been moved to neutral and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed and beginning to control said

output speed of said engine output shaft to approach said synchronization speed;

(f) receiving a change in the driver shift intent from said operator switch, after step (e), and recalculating said next expected gear based upon said change driver shift intent, and determining a new synchronization speed based upon said changed driver shift intent;

(g) moving said engine output speed to approach said synchronization speed; and

(h) manually shifting said multi-speed transmission towards said next expected gear.

141. A vehicle drive comprising:

an engine having an output shaft and an electronic control unit for controlling the output speed of said engine output shaft;

a multi-speed transmission, said multi-speed transmission being selectively connected to said engine output shaft and operable to convert drive from said engine output shaft through several speed ratios to an output speed on a transmission output shaft;

a clutch that may be selectively actuated by an operator, said clutch positioned between said engine and said transmission; and

an input control for an operator, said input control allowing an operator to provide an indication to said electronic control unit that a particular shift is to be initiated, the input control providing the operator the ability to request torque elimination during this shift, said electronic control unit being operable to receive signals from said input control, and determine a desired engine speed at the next gear ratio based upon receiving said operator indication, and to control said engine to achieve said desired engine speed, and said electronic control unit further being operable to modify an engine parameter to achieve reduced torque transmission to said transmission to allow an operator to move said transmission to a neutral position when a signal requesting torque elimination is received from said input control.

142. A method of operating a vehicle comprising the steps of:

a. providing a vehicle drive including an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, a multi-speed transmission selectably driven by said engine output shaft, said multi-speed transmission being operable to be moved between several speed ratios to control the ratio between an output speed on an output shaft of said transmission and the speed of said engine output

shaft, a clutch disposed between said engine output shaft and said transmission to allow a elimination of drive from said engine to said transmission, and an operator input switch system allowing an operator to provide an indication to said electronic control unit that a particular shift is to be expected, the operator input switch system providing the operator the ability to request torque elimination from said electronic control unit such that the transmission may be moved to neutral without actuating said clutch;

b. providing an indication to said electronic control unit of whether an upshift or a downshift is expected as the next gear shift;

c. identifying a desired engine speed at the next expected gear ratio based upon said driver input of whether an upshift or a downshift is next expected;

d. providing a torque elimination request from said operator switch;

e. controlling an engine parameter to reduce the torque load from said engine on said transmission;

f. manually moving said transmission to neutral;

g. using said electronic control unit to begin moving said engine output speed to said desired engine speed; and

h. engaging said transmission in said next selected

gear.

143. A vehicle drive system comprising:

a) an engine having an output shaft;

b) an electronic control unit for controlling an output speed of said engine;

c) a multi-speed transmission operably connected to be driven by said engine output shaft;

d) a manual stick shift to allow an operator to change the speed ratios of said transmission; and

e) a driver shift intent switch to allow a driver to send a signal to said electronic control unit that a particular shift is to be expected, said electronic control unit being operable to determine a currently engaged gear, determine a next expected gear based upon said currently engaged gear and based on receiving said driver shift intent signal, determine a synchronization speed for shifting to said next expected gear, and change said engine speed to move toward said synchronization speed when a shift is being made.--

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REMARKS

Applicant is filing concurrently herewith an Appointment of Associate Attorneys Under 37 CFR §1.34(b).